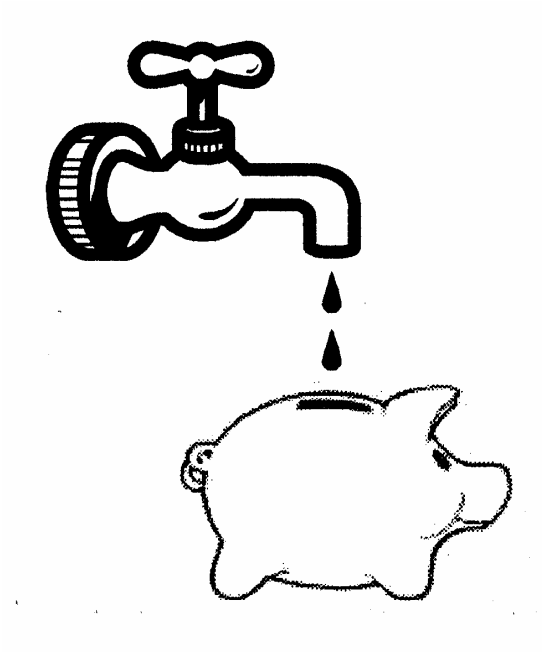
The Bay Institute of San Francisco

The Second Annual State of the Environmental Water Account Report



October 2002

The Bay Institute (TBI) is a non-profit research, education and advocacy organization dedicated to protecting and restoring the ecosystems of San Francisco Bay, the Sacramento-San Joaquin Delta, and the rivers, streams and watersheds tributary to the estuary. For more information about TBI, call us at (415) 506-0150, write us at 500 Palm Drive, Suite 200, Novato, CA 94949, or visit our website at www.bay.org.

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Executive Summary

The Environmental Water Account (EWA), CALFED's innovative and controversial new water management tool intended to protect endangered fish from the harmful impacts of federal and state water project operations without reducing water supply or deliveries from the Delta, has completed its second year. In its first year, EWA failed its endangered species protection test because it wasn't ready – nearly 20,000 winter-run chinook salmon were killed at the Delta pumps because the EWA lacked promised water supplies, operational tools, and back-up protections. Analysis of that first year revealed serious flaws in EWA design and implementation, but it also clearly pointed the way towards the changes were needed to improve this potentially promising tool. That made the EWA's second year even more important - a test of the will and ability of CALFED, its member agencies, and its diverse stakeholders to work together to make the EWA function as envisioned.

This report describes and evaluates the EWA during its second year, a year marked by new and unexpected challenges that shook the CALFED foundation upon which the EWA was built and tested the commitment of all those with a stake in making the EWA work. Based on this analysis, The Bay Institute concludes that several of the critical problems identified last year remain unsolved, and new ones, revealed this year, further threaten the viability the EWA as an effective fish protection tool.

In 2002, the EWA was once again seriously under-endowed and incomplete, shortchanged on both its prescribed water assets as well as its promised groundwater reserve. Fortunately for the fish, this year's relatively benign conditions offered few opportunities to test the EWA's capability to satisfy specific ESA-mandated protections like take limits. Instead, the EWA's lack of access to secure short-term storage for its unspent water cost it nearly 20% of its supply when south-of-Delta water contractors, who are the direct beneficiaries of the EWA, were unwilling to offer affordable alternatives. This was particularly costly for the publicly funded EWA when, a month later, it was forced to assume assumed additional fish protection responsibilities when CALFED's baseline level of protection was undermined by a court decision halting the use of hundreds of thousands acre-feet of federally mandated environmental water. (These shortcomings will be further exacerbated in coming years if the EWA is forced to grow in size to offset the fishery impacts of allowing even higher levels of export pumping – a project actively under development by CALFED).

Despite these problems, the EWA implemented several fish protection actions, protecting delta smelt and chinook salmon with export curtailments and enhancing stream flows for salmon and steelhead in the American and Merced Rivers. However, continuing limitations in the monitoring and analyses necessary to evaluate the effects of EWA actions will prevent the kinds of comparisons needed to optimize the effectiveness of EWA actions.

The Second Annual State of the Environmental Water Account Report

The Environmental Water Account (EWA) has completed its second year as the CALFED's Bay-Delta Program's primary tool for the protection of fish from the harmful impacts of state and federal water project operations.[1] When the EWA was first implemented, it was an innovative but untested tool, essentially an expensive, large-scale experiment aimed at facilitating cooperation between the water projects, which export vast amounts of water from California's Sacramento-San Joaquin watershed, and the fishery agencies charged with protecting the fishes endangered by those operations. It was controversial because, despite literally no record of success, the EWA was charged with an enormous regulatory responsibility—providing the protection for threatened and endangered fish species that is mandated by the federal Endangered Species Act (ESA). The EWA's first year was marked by unprecedented collaboration among formerly adversarial agencies but an equally unprecedented lethal taking of endangered winter-run chinook salmon, nearly 20,000 young fish killed at the pumps in the space of a few weeks. That year, the EWA failed its endangered species protection test because it was not ready, lacking both promised water supplies and operational tools. Analysis of that first year revealed serious flaws in both the design and implementation of the EWA, but also pointed the way towards the changes that were needed to improve this potentially promising tool. Thus, the EWA's second year may be even more important - a test of the will and ability of CALFED, its member agencies, and its diverse stakeholders to work together to make the EWA function as envisioned.

This report describes and evaluates EWA implementation during Water Year 2002.[2] It follows and builds upon *The First Annual State of the Environmental Water Account Report*, which examined the origins of the EWA and analyzed its first eventful year.[3] That report began with three questions:

- Did the EWA fulfill its promise of endangered species protection and recovery?
- How can the EWA be improved in the coming years?
- Is the EWA adequate to protect fish in the face of new water storage and conveyance projects?

These questions are equally relevant today. While some of the problems revealed by the EWA's first year have been addressed and several aspects of EWA implementation improved as EWA managers learned by experience, in 2002, the EWA was faced with new and unexpected challenges, some of which threatened the policy underpinnings of the EWA and its integration with CALFED and the ESA. Thus, rigorous, critical

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[1] A collaborative program of 24 state and federal agencies to develop and implement a plan to restore the Sacramento-San Joaquin watershed and Bay-Delta ecosystem, increase water supply reliability, improve water quality, and improve levee management and flood control.

[2] Water Year 2002 is from October 1, 2001, through September 30, 2002.

[3] *The First Annual State of the Environmental Water Account* (The Bay Institute, 2001) is available online at http://www.bay.org/science/EWA01-4.pdf, and is briefly summarized in Appendix I.

evaluation, coupled with responsive modifications to EWA design and operation, must continue if the EWA is to be considered a scientifically justifiable and legally defensible approach towards endangered fish protection.

WHAT IS THE ENVIRONMENTAL WATER ACCOUNT?

The Environmental Water Account (EWA) is a supply of water and a set of water management tools managed by federal and state fishery agencies (US Fish and Wildlife Service, USFWS, National Oceanic and Atmospheric Administration, NOAA Fisheries, and California Department of Fish and Game, CDFG, collectively referred to as the Management Agencies). The Management Agencies use the EWA to modify federal Central Valley Project (CVP) and State Water Project (SWP) operations, primarily to reduce the direct impacts of the south Delta pumps on fishes in the Delta, and also to improve instream and Delta habitat conditions. For example, the EWA can release water from a reservoir to improve instream flows for chinook salmon, or reduce export rates in the Delta when delta smelt are concentrated near the pumps and vulnerable to lethal entrainment. If an EWA fish protection action results in reducing the amount of water ultimately delivered by the CVP or SWP, the project is compensated in the amount of the shortfall with water from EWA supplies.

The EWA can acquire water in three ways: 1) purchase water from willing sellers; 2) borrow water from the state or federal projects; and 3) acquire water by relaxing the export/inflow ratio regulatory criterion and by using its access to Delta pumping capacity to capture environmental water released upstream, surplus water or, in some cases, project water in the Delta, collectively referred to as variable assets. Funding is provided jointly by the State and federal governments.

The purpose of the EWA was to provide water for protection and recovery of fish, supplemental to other fish and environmental protections already in place and identified by CALFED as the "baseline level of protection". Baseline protections, or Tier 1, included: the Water Quality Control Plan (WQCP), a set of water quality and operational standards for the Delta issued by the State Water Resources Control Board in 1995; full use of Central Valley Project Improvement Act (CVPIA) (b)(2) water as outlined in the Department of Interior's 1999 Decision; and selected protections contained in the ESA-required Biological Opinions[4] for winter-run chinook salmon and delta smelt.[5] Tier 2 protections consisted of the EWA and the assumed environmental benefits afforded by a fully funded and active Ecosystem Restoration Program. The final layer of protection, Tier 3, was the commitment of CALFED to make additional water available in the event that the combined protections of Tiers 1 and 2 were inadequate to satisfactorily protect ESA-listed species.

[4] A Biological Opinion is developed after formal consultation between federal fisheries agencies and the CVP and SWP when a fish species impacted by their operations is listed under the ESA. For each listed species, the document details the allowable limits of project operation, for example minimum flow requirements in a dammed river or the maximum number of fish that can be killed within a specified period at the pumps, referred to as the take limit.

[5] Although environmental protections specified in the Biological Opinion for delta smelt, i.e., elevated San Joaquin River flows and reduced exports during the spring, are identified as a baseline, or Tier 1, protection, SWP water costs resulting for satisfying this requirement are charged to the EWA and CVP costs are charged to the (b)(2) account.

In exchange for CALFED's three-tiered suite of protections, the fishery agencies agreed that they would require no reductions, beyond existing regulatory levels, in CVP or SWP Delta exports for the protection of state and federally listed threatened and endangered fish species. These ESA commitments were to be granted annually and premised on full funding and availability of the three tiers of protections, as defined in the CALFED ROD.

WATER YEAR 2001

RECAPPING THE ENVIRONMENTAL WATER ACCOUNT'S FIRST YEAR

In its first year, the EWA expended nearly $57,000,000, acquired 298,000 acre-feet (AF) of water (barely 50% of the amount projected by CALFED), and implemented ten fish protection actions. Despite the fact that CALFED's Tier 3 protections were not in place, ESA commitments were issued in January 2001. Two months later, the ESA-mandated "take limits" for endangered winter-run chinook salmon and threatened steelhead were exceeded by a factor of three and the EWA, out of water, terminated its protections even as thousands of endangered fish continued to be killed at the pumps. The EWA regrouped, buying more water during the following months to provide planned fish protection during the ecologically sensitive spring period, and ultimately ended the water year with more than 50,000 AF of water.

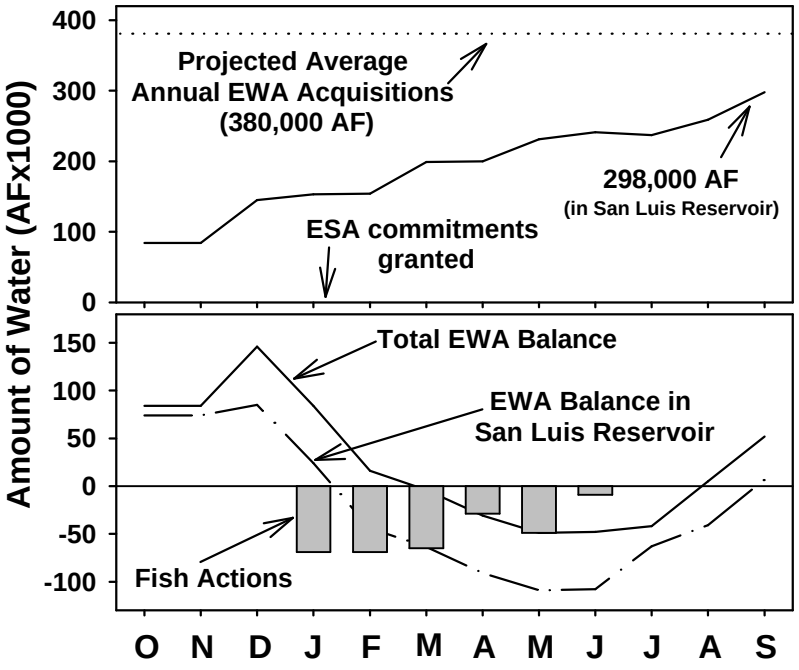

Figure 1. EWA water acquisitions in 2001.

Figure 2. EWA balance and expenditures in 2001.

THE ENVIRONMENTAL WATER ACCOUNT IN 2002

The EWA began its second year with 52,000 acre-feet (AF) of water, a sharply reduced budget, a more experienced if not enlarged Project and Management Agency staff, limited Tier 3 funding but no implementation protocol, and the recognition that it likely could not do business as it had the previous year. In its first year, the EWA had faced enormous challenges trying to protect endangered fish as required, and it stumbled when it exhausted its assets during a historic take exceedence for winter-run chinook salmon and was denied access to operational flexibility as originally envisioned. In 2002, managers feared inadequate resources would once again limit their ability to provide needed fish protection but they expected that their access to operational flexibility would be improved. As with most experiments, not everything went as expected.

Funding

Although the EWA received funding from both state and federal sources, the budget for the EWA in water year 2002, a total of $40,800,000, was significantly reduced compared to the first year ($67,500,000). Nearly 70% of the money, $28,300,000, was provided by the State, with the balance ($12,500,000) supplied by the federal government.

Water Acquisition

The EWA accumulated a total of 369,000 AF of water, 52,000 AF of which was water carried over from the previous year. Nearly half of the water was acquired from upstream-of-Delta sources (i.e., 142,000 AF from sellers in Sacramento and San Joaquin basins) and subsequently pumped from the Delta by the EWA using its access to SWP pumping capacity. The EWA also purchased 93,000 AF from south-of-Delta water contractors and acquired 79,000 AF of water by using one of its variable assets, relaxation of the Export/Inflow ratio, to pump water from the Delta at rates higher than permitted under the WQCP during November (3,000 AF) and February (76,000 AF). In contrast to the previous year, EWA capture of upstream releases of (b)(2) water was negligible (3,000 AF), although some of the carryover from 2001 was from capture of releases of (b)(2) water in August and September of 2001. After accounting for carriage water losses accrued during transfer of EWA water across the Delta[6] and loss of 20,000 AF in an unbalanced exchange between the EWA and a water contractor (see **Losses of EWA Water** below), the EWA had 297,000 AF of water available to compensate for reduced deliveries resulting from fish protection actions, approximately 80% of the annual amount specified in the CALFED ROD (Figure 3 and Table 1). The average price the EWA paid to purchase water in 2002 ($118/AF) was considerably less than it paid in 2001 ($179/AF).

[6] Not all EWA water released from upstream storage can be captured in the Delta and exported. The fraction of the water that cannot be exported, referred to as carriage water, usually ranges from 10- 25% of total released but may be as high as 50% in some hydrological conditions.

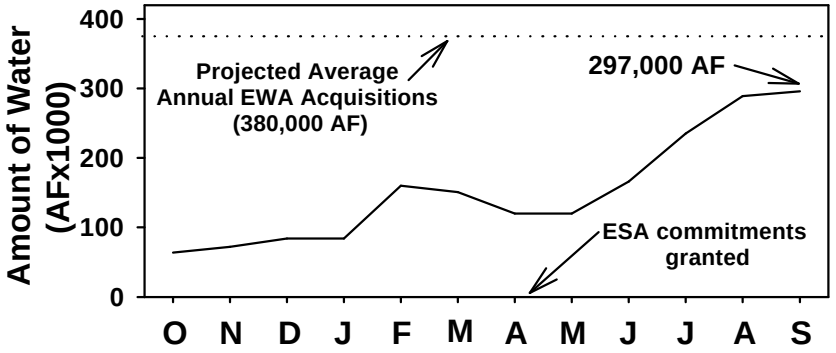

Figure 3. EWA water acquisition in 2002.

Tier 3

At the start of Water Year 2002, limited funds for purchase of Tier 3 water had been allocated ($6,250,000), but protocols for using Tier 3 protection were not established until April 2002, when the 2002 Interim Protocols for the Operation of the EWA were published.[7] While CALFED's original description of Tier 3 contained in the ROD had been subject to diverse and conflicting interpretations, the protocols adopted placed a high standard for use of the back-up protections, specifying that Tier 3 could not be invoked until all EWA assets had been exhausted and the Management Agencies had determined that an ESA-listed species would be jeopardized if project operations were not modified.

Tier 3 Protocols

Tier 3 is the commitment of CALFED agencies to make additional water available should it be needed to meet ESA requirements. The operating protocols state:

1. Tier 3 is not an operating reserve for Tier 2, and its actions are separate from those of the EWA.
2. Tier 3 can be used only after EWA resources have been exhausted and the Management Agencies, in consultation with an independent science panel, have determined that jeopardy of a listed species will occur unless additional protective measures are taken.
3. Tier 3 assets will be used to the extent possible to compensate the projects and water users for impacts to their water supply, but there is no commitment that water supply looses will be fully mitigated.

[7] The 2002 Interim Protocols for the Operation of the Environmental Water Account are available at http://wwwoco.water.ca.gov/calfedops/2002ops.html.

Table 1. Comparison of water acquisition by the Environmental Water Account in 2001, 2002, and as specified in the CALFED Record of Decision. Values are in acre-feet (AF).

Source of Water	Amounts specified in CALFED ROD	EWA Acquisitions 2001	EWA acquisitions 2002
Purchases			
South of Delta	**150,000**	**127,000 + 72,000**[1]	**93,000**
Upstream of Delta	**35,000**	**51,000**[2]	**142,000**
Variable Assets			
Export/Inflow relaxation (100% of all water above the baseline E/I ratio)	**30,000**	**2,000**	**79,000**
State Gain (50% of SWP pumping of b)(2)/ERP upstream releases)	**40,000**	**46,000**	**3,000**
Joint Point of Diversion (50% of water pumped using JPOD)	**75,000**	**0**	**0**
500 cfs SWP pumping increase	**50,000**[3]	**0**	**0**
Losses			**-20,000**[4]
TOTAL	**380,000**	**298,000**	**297,000**
One-time deposit of 200,00 AF	**200,000**	**0**	**100,000**[5]

[1] In 2001, the CVP provided the EWA with 72,000 AF of water stored in San Luis Reservoir, valued at $10,000,000.

[2] In 2001, the EWA purchased 105,000 AF of water from upstream sources, however only 51,000 AF of that water was available to the EWA for use during that year. Of the balance, some was applied to carriage water losses accrued during the transfer of the water across the Delta and the balance was carried over for use in 2002 (and included in the amount of upstream of Delta purchases shown for 2002).

[3] The CALFED ROD erroneously identified EWA use of 500 cfs of SWP pumping capacity as a water acquisition tool. In fact, use of the 500 cfs of SWP pumping capacity by the EWA is allowed only from July-September and is limited to transferring EWA water purchased upstream of the Delta to San Luis Reservoir for storage or repayment of EWA debts. Thus the ROD, in specifying the anticipated annual amount of water to be acquired by the EWA, "double counted" water assets purchased upstream of the Delta and those "acquired" using SWP pumping capacity during the summer, inflating the total amount of water expected to be acquired each year.

[4] In March 2002, to avoid losing its water stored in the rapidly filling San Luis Reservoir, the EWA transferred 40,000 AF to a south-of Delta water contractor with the agreement that, later in the year, it would recover half of the amount, 20,000 AF (a 2:1 exchange), effectively a cost of $2,400,000 (at $120/AF) for temporary storage of EWA water.

[5] In 2002, the SWP agreed to loan the EWA 100,000 AF of water stored in San Luis Reservoir. This was considered to be the "functional equivalent" of the one-time deposit of 200,000 AF of water stored in south-of-Delta groundwater banks that was intended to endow the EWA and provide it with the collateral it needed to guarantee its actions.

Changes in (b)(2) Water and the CALFED Baseline

In December 2001 and February 2002, two U.S. Eastern District court rulings in a lawsuit brought by south-of-Delta water users over the Department of Interior's (DOI) use of CVPIA (b)(2) water significantly reduced the amount of that environmental water supply that was available for fish protection, effectively eliminating a substantial portion of the baseline fish protections contained in CALFED's Tier 1. The first ruling eliminated the cap on the maximum amount of (b)(2) water that could be used by the CVP to satisfy its Delta water quality requirements. Because the water costs for satisfying WQCP standards cannot be calculated until the end of the water year, and the (b)(2) account is itself rigidly capped at 800,000 AF per year, the uncertainty regarding the amount of remaining (b)(2) available for fish protection effectively hamstrung the USFWS's use of this fish protection tool. The second ruling changed two accounting methods that had been developed by DOI to more accurately measure the impacts of use of (b)(2) water on CVP supplies and resulted in further reductions in the amount of (b)(2) water available for fish protection. Recent computer modeling exercises conducted by the Department of Water Resources indicate that, on average, these changes reduced the amount of environmental (b)(2) water available each year for baseline fish protection by more than 300,000 AF, greater than the total amount of EWA water used in each of the past two years.

In addition to the erosion of the CALFED baseline protections, these changes directly affected the EWA's ability to acquire water using one of its variable assets, capture and export of (b)(2) water released upstream[8]: with less (b)(2) water available for fish protection, less is released to improve instream flows, and therefore less is available for capture and export from the Delta by the EWA.

ESA Commitments

The significant erosion of the CALFED baseline resulting from the (b)(2) rulings created chaos among the Management and Project Agencies, who had been completing agreements for ESA commitments for 2002. Full use of the CVPIA (b)(2) water as specified by DOI's 1999 rules was a integral part of the foundation upon which the EWA was built and an explicit prerequisite for granting ESA commitments. The EWA had been designed to provide fish protections that were complementary to those provided by (b)(2)—reductions in the amount of (b)(2) water implied that, at a minimum, the size of the EWA should be increased to compensate. But, mid-way through the water year, the EWA was itself still under-supplied, including the continued absence of the promised one-time deposit of 200,000 AF of south-of-Delta groundwater. Negotiations resumed and continued for several months, most of the critical fish protection season passed without incident, leaving EWA water supplies largely unspent (but see **Losses of EWA Water** below) and, in April 2002, ESA commitments were finally granted. Among the critical elements of the deal was the agreement by the SWP to "loan" the EWA up to

[8] The EWA is entitled to 50% of any (b)(2) or other environmental water that was released upstream to improve instream habitat for fish and is subsequently captured and exported by the SWP, a variable asset referred to as "state gain" that was expected by CALFED to provide an average of 50,000 AF of water per year to the EWA.

100,000 AF of its water stored in San Luis Reservoir, providing the EWA with the "functional equivalent" of the missing 200,000 AF groundwater endowment.

Fish Protection

The EWA implemented seven fish protection actions in Water Year 2002, expending 287,000 AF of water.[9] Compared to 2001 when its activities were limited to curtailing south Delta export rates to reduce the numbers of fish killed at the pumps, the EWA used a more creative mix of actions in 2002. During the fall, the EWA acted to improve instream habitat conditions. In two cases, the EWA released its own water from upstream reservoirs, accomplishing the dual purpose of enhancing flows for fall-run chinook salmon migrating up the American and Merced Rivers to spawn and simultaneously transferring its water from upstream storage through the Delta to San Luis Reservoir, where it would be available to compensate the water projects for reduced deliveries resulting from fish protection actions at the Delta pumps later in the year. In a third instance, the EWA provided American River chinook salmon and steelhead with cooler water by ordering that water released from Folsom Reservoir bypass the power generating turbines, allowing cooler water from deeper in the reservoir to be released rather than warmer surface water. The EWA compensated the CVP for reduced power production using power generation credits it acquired through other operations later in the year. The remaining fish protection actions were export curtailments to reduce the numbers of fish killed at the CVP and SWP pumps and to improve in-Delta flow conditions during the ecologically sensitive spring period. The first export cut was made in January, when large numbers of pre-spawning adult delta appeared in the south Delta. SWP pumping rates were slashed more then 80% for five days and the numbers of delta smelt killed at the pumps declined sharply. It was not until April that the EWA was called upon to cut exports again, when the Vernalis Adaptive Management Plan (VAMP), a pre-planned operations modification that combines exports cuts with enhanced San Joaquin River flows to protect juvenile San Joaquin basin chinook salmon and young delta smelt, was implemented. While in previous years (as well as in the early planning for this year), (b)(2) water had been used to support export cuts at the CVP, this year, because the amount of (b)(2) water available for fish protection was sharply reduced, the EWA was forced to assume more than 70,000 AF of these costs, increasing the total amount of EWA water expended to compensate for protective export curtailments in 2002 by more than 30%.

[9] Eight EWA actions are described on the CALFED Operations website (http://wwwoco.water.ca.gov/calfedops/2002ops.html), however, only six of these were discretionary fish protection actions. In addition, transfer of EWA water purchased on the Merced River through the Delta in October and November 2002 provided some benefits to fall-run chinook salmon migrating up the Merced River, but it was not explicitly identified as an EWA action.

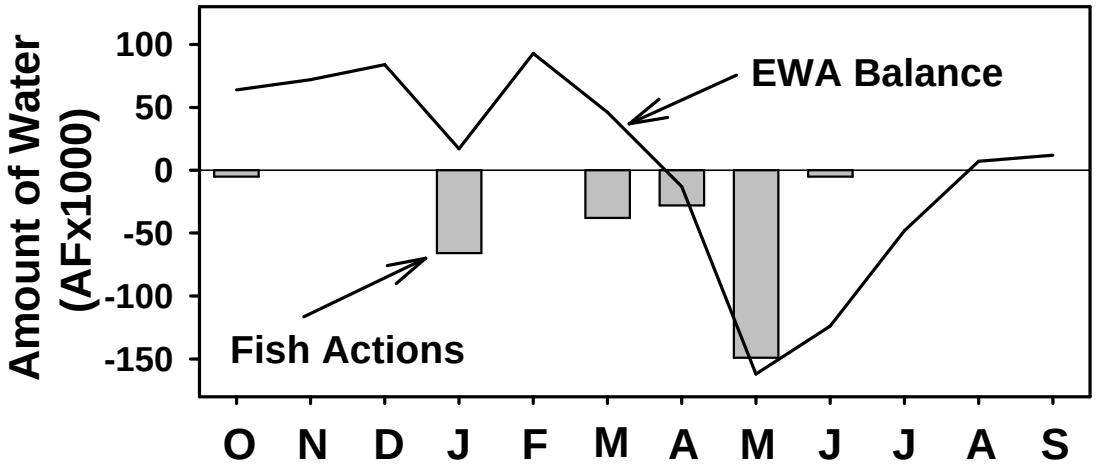

Figure 4. EWA balance and expenditures in 2002.

October-November 2001: EWA releases water down the American and Merced Rivers for transfer through the Delta to San Luis Reservoir and to improve habitat conditions for fall-run chinook salmon and steelhead. *Cost*: 7,000 AF, as carriage water losses.

November 2001: EWA orders water released from Folsom Reservoir to bypass power generation turbines, providing cooler water for fall-run chinook salmon and steelhead on the American River. *Cost*: 0 AF, but the EWA compensated the CVP for 4,276 megawatt hours in lost power production with power credits it generated elsewhere in the system.

January 2002: EWA cuts SWP export rates by 80% for five days to protect delta smelt. *Cost*: 66,000 AF.

March 2002: EWA water stored in San Luis Reservoir "spills" as the SWP fills the reservoir with its water. Efforts to find alternative storage for EWA water fail although one south-of-Delta contractor ultimately agrees to accept 40,000 AF of EWA in exchange for returning 20,000 AF of water to the EWA later in the season (a 2:1 exchange). Although there are no immediate fish protection needs in the Delta, SWP pumping rates are reduced for seven days, as 38,000 AF of EWA water stored in San Luis Reservoir converts to the SWP. *Cost*: 58,000 AF.

April 15-May 15 2002: As part of the Vernalis Adaptive Management Program, CVP and SWP export rates are cut to protect juvenile San Joaquin basin chinook salmon and young delta smelt. EWA water compensates for cuts at the SWP and (b)(2) water supports cuts at the CVP. *Cost to the EWA*: 45,000 AF.

May-June 2002: Management Agencies continue springtime fish protection by maintaining exports at low rates through the first week in June. EWA water compensates for cuts at the SWP and assumes 72,000 AF of costs for cutting CVP exports from the now empty (b)(2) account. *Cost to the EWA*: 136,000 AF.

Losses of EWA Water

After the brief flurry of activity to protect delta smelt in January, Management Agency scientists shifted their monitoring efforts to winter- and spring-run chinook salmon, expected to begin moving downstream towards the ocean in January, February and March. The 2001 experience with winter-run chinook salmon had prompted changes in the method used to calculate the expected number of juvenile fish (i.e., the juvenile production estimate) and the new results suggested that even larger numbers of the endangered fish could be expected to migrate through the Delta in 2002. However, monitoring on the rivers and in the Delta detected few fish, and the numbers never reached levels set to trigger an EWA fish protection export curtailment. In the meantime, the absence of fish and the need for protective export cuts offered the EWA an opportunity to use its Export/Inflow relaxation variable asset to acquire more water and store it in San Luis Reservoir, to be used to compensate for export curtailments anticipated in the near future. Over a period of three weeks in February, the EWA collected 76,000 AF of water, adding to the 10,000 AF it already had stored in San Luis Reservoir.

As fishery scientists puzzled over where the fish were, the CVP and SWP continued to export Delta water to the rapidly filling San Luis Reservoir. By mid-March, EWA water stored in SWP space in San Luis Reservoir was in danger of "spilling", forced out as the SWP filled the reservoir with its water. EWA managers began looking for alternative storage for their water. Their options included:

1. Transfer the EWA water from the SWP side of San Luis Reservoir to the CVP side of the reservoir. This option offered limited benefit as the CVP was expected to fill its share of San Luis Reservoir a few weeks after the SWP.
2. Transfer EWA water to upstream SWP or CVP reservoirs by reducing releases from those reservoirs and crediting the water to the EWA (an operation referred to as "backing up" water). This option was not possible because the CVP and SWP were making reservoir releases only to provide enough water to satisfy Delta water quality standards, rather than support their export levels, and thus could not reduce them further.
3. Exchange EWA water with water contracted to a south-of-Delta user. The contractor would take delivery of EWA water rather than their own contract supply and, later in the season, return water to the EWA from their contracted supply stored in San Luis Reservoir. A number of contractors were approached, including some supplied by the CVP's Friant Unit that receives water from the San Joaquin River rather than the Delta. However, costs for the proposed exchange demanded by the contractors were excessive and complicated by the restriction that the EWA water stored in the SWP side of the San Luis Reservoir be exchanged only with an SWP contractor.
4. Store EWA water in a groundwater bank in the San Joaquin Valley, essentially an exchange with a groundwater bank that received contract water from the SWP. However, the EWA's offer of a 1.5:1 exchange (e.g., the EWA would transfer 60,000 AF of water and be reimbursed later in the season with 40,000 AF of water) was refused and countered with a more expensive offer of a 3:1 exchange.

After examining these options, EWA managers and fishery scientists from the Management Agencies determined that costs for the proposed exchanges were prohibitively high and that, on a relative basis, the stranded EWA water would provide greater environmental benefit flowing out the Delta into the Bay than as far smaller amounts of export curtailments later in the year. Thus on March 23, when the SWP share of San Luis Reservoir physically filled (i.e., with the combined amounts of SWP and EWA water), the SWP cut its export rates, the EWA water stored in the reservoir "converted" (i.e., "spilled") to SWP water at a rate equivalent to the export curtailment, approximately 5,000 AF per day, and water flowing into the Delta that had been captured and exported by the SWP flowed towards the Bay. In recent years, when the SWP had filled its share of San Luis Reservoir and if it had pumping capacity and there was exportable water in the Delta, the SWP would offer to provide water directly to those of its south-of-Delta contractors that could accept additional water, for example those with access to groundwater or surface storage. The cost of this water, called "Article 21 water" is substantially less than that of regular contract supplies. The reduction in SWP pumping as the EWA water in San Luis Reservoir slowly converted to the SWP was viewed as just such an opportunity and a number a south-of-Delta contractors requested that the SWP begin providing Article 21 water. However, in contrast to its operations in 2001 when the SWP prematurely provided Article 21 water and subsequently never filled San Luis Reservoir, leaving the EWA with unnecessary debts, the SWP had agreed it would not pump Article 21 water until its share of San Luis Reservoir was completely filled with its own water—a condition that would not occur until all of the EWA water stored in San Luis Reservoir converted to the SWP, expected to take several weeks. This situation proved to be the incentive needed by the south-of-Delta contractors to renegotiate an exchange deal for EWA water remaining in the reservoir, ultimately resulting in 2:1 exchange of 40,000 AF of EWA water. In the end, 38,000 AF of EWA water flowed into the Bay, providing some small benefit to the Bay-Delta ecosystem but no targeted protection for endangered fish species.

HIGHLIGHTS AND LOW POINTS - EVALUATING THE ENVIRONMENTAL WATER ACCOUNT IN 2002

The size and shape of the EWA and its operations in 2002 were markedly different from those anticipated during EWA development as well as those implemented in the previous year. In addition, the abrupt reduction in CALFED's baseline level of protection forced the EWA to assume new responsibilities. The following sections offer some perspectives on the EWA in 2002 and highlight some of the lessons learned during the past two years.

Collaboration and Cooperation Among Agencies and Stakeholders

As in 2001, the successful collaboration of the Management and Project Agencies to implement and operate the EWA was an important achievement. During the past year, both groups of state and federal agencies worked diligently to improve and better integrate the management, monitoring, and analytical tools that are essential for EWA operation. While not all of the scientific and management questions relating to biological protection or water operations were answered (or even addressed, in some

cases), progress was made to put the tools in place and to learn how to operate the EWA better. This was particularly challenging in the face of the reduced funding and static (or shrinking) staffing levels that characterized 2002.

In contrast, cooperation and support from south-of-Delta water contractors during the March 2002 period, when the EWA needed access to temporary storage for its water, was considerably less encouraging. South-of-Delta urban and agricultural water users are direct beneficiaries of the publicly funded EWA, which guarantees their water deliveries, uninterrupted by actions to protect federally listed endangered fish species. The attitude of some contractors that the EWA also represented an opportunity for profit and cheap access to additional water supplies was antithetical to CALFED's stated objective for the EWA of cooperative water management to resolve conflicts over this precious resource.

There is some evidence that this state of affairs may be improving. As Water Year 2002 drew to close, the EWA again had unspent water stored in San Luis Reservoir, and its managers, concerned that they could face similar problems spilling water if the projects filled the reservoir early, began exploring options for more secure storage of their water. In this instance, EWA needs converged with those of the Metropolitan Water District, a large SWP contractor searching for high quality water to blend with its Delta and Colorado River supplies, and a groundwater bank in the San Joaquin Valley. Ultimately, the three entities negotiated a three-way exchange in which the EWA received access to free temporary storage, Metropolitan Water District exchanged some of its salty Delta water for high quality groundwater, and the water bank enjoyed the opportunity to pump water during periods of time when pumping costs were reduced. Although the final shape of this deal is still in development, it appears to mark an improvement in cooperation among the EWA's diverse stakeholders and in utilizing flexibility in water management operations.

New Water Acquisition Strategies

Analyses of EWA purchasing and water expenditures during the previous year, as well as results of a series of intriguing computer modeling exercises reported by the Natural Heritage Institute,[10] convinced EWA managers to alter their purchase strategy in 2002. There were several reasons the EWA water acquisition plan outlined in the CALFED ROD failed to meet EWA needs. First, the EWA had barely 60% of the amount of money it expended on water purchases in 2001—it could not afford to buy the amounts of water prescribed in the CALFED ROD. Second, EWA managers recognized that it was difficult and expensive to purchase water from south-of Delta sources in dry years. Alternatively, in wet years, it was difficult to transfer EWA water from upstream sources through the Delta because excess SWP pumping capacity available for EWA use was very limited. The most efficient purchase pattern was to concentrate water purchases in the south during wet years and in the north during dry years. The obvious limitation of this strategy is that EWA managers cannot predict what type of year it will be at the time they must begin negotiating water purchase contracts (usually in the late fall and winter). The solution used effectively in 2002 was to reduce the amounts of direct water purchases and to instead purchase water options, locking up access to blocks of water

[10] *Got Water? Developing an Optimal Asset Purchasing Strategy for the CALFED Environmental Water Account*: EPRI, Palo Alto, CA, and the Natural Heritage Institute, Berkeley, CA: 2002.

with small non-refundable deposits, from both upstream and south-of-Delta sources and then to call on those options based on needs and conditions as the water year progressed.

The other major revelation to EWA managers was that the EWA's variable assets, in their present form, could not provide the 50% of EWA supplies predicted by CALFED in the ROD (an average of 185,000 AF per year). First, one of the variable assets provided by CALFED, EWA use of 500 cfs of SWP pumping capacity during the summer, was in fact not a water acquisition tool at all. Instead, the EWA was limited to using this tool to pump its own purchased water supplies. Thus, in specifying the anticipated annual amount of water to be acquired by the EWA using this tool, CALFED "double counted" water assets purchased upstream of the Delta and those "acquired" using SWP summer pumping capacity. Second, the reduction in (b)(2) water available for upstream fish protection severely impaired another of the EWA's variable assets, capture and export of environmental water released upstream. Finally, opportunities for use of Joint Point of Diversion appeared to be far more limited than anticipated. In both 2001 and 2002, the shortfall in EWA supplies was largely attributable to the inadequate performance of the variable assets. In 2002, the under-endowed EWA completed the year without serious problems with fish protection (although the apparent absence of fish to protect was a grave concern for Management Agency scientists). However, in 2001, the EWA's inadequate water supply directly contributed to its inability to fulfill its fish protection responsibilities and the unprecedented take exceedence of endangered winter-run chinook salmon.

Recent computer simulation and gaming exercises conducted by Project Agency and stakeholder modelers, designed to explore the effects of the changes in (b)(2) water supplies and the proposed expansion of SWP pumping capacity on the EWA, have revealed that one of the key features of the EWA is the extreme volatility in the amounts of water it needs to protect fish from year to year. In some years, like 2002, hydrology and fish behavior converge to require few protective modifications of water project operations. In others, EWA costs can be extremely high, far in excess of the 380,000 AF projected by CALFED. Combined, these analyses and the past two years of EWA operations, underscore the EWA's critical need for guaranteed access to short-term and multi-year storage (i.e., "non-spillable" storage) and a substantial operating reserve, such as the promised 200,000 AF of south-of Delta groundwater, to provide collateral during those periods when fish protection costs may be high.

Creative and Aggressive Fish Protection

In contrast to the EWA's first year, when it restricted its actions to modest curtailments of Delta export rates, EWA managers deployed the EWA more creatively and more aggressively in 2002. The use of the EWA to provide cool water on the American River, as well as EWA actions that combined fish protection with management of its water assets, were good examples of creative, cost-effective, collaborative EWA operations. The rapid response and aggressive use of the EWA (i.e., cutting SWP exports by 80% rather than by some smaller increment) to protect delta smelt in January was also an encouraging improvement. However, with the exception of the regular reports on fish salvage rates at the CVP and SWP, monitoring and analysis to gauge the effectiveness of EWA actions remained too limited. This is particularly unfortunate given that this year's operations offered valuable opportunities for comparisons of the relative benefits of

different types of uses of environmental water. The EWA is, after all, an experiment. Hypothesizing the effects of fish protection actions without concomitant measurements of their results is a wholly inadequate approach for a supposedly science-based, adaptive management tool. Further, the need for answers to these questions is not just academic—the answers are critical to determine whether the EWA is satisfying its fish protection and recovery responsibilities, and they will provide the bases for appropriate and effective modification of the EWA, should it be continued, to improve its effectiveness.

Reductions in the CALFED Baseline Protection Threaten the EWA

During development of the EWA, few decisions were more critical than definition of the "baseline", the level of regulatory protection above which the EWA would function and against which its costs and protective capabilities would be measured. Thus, the significant reduction in the levels of protection encompassed in CALFED's Tier 1 baseline resulting from the recent (b)(2) rulings represented a serious threat to the EWA from policy, legal and operational standpoints. Further, use of the already stressed EWA to cover the shortfall in (b)(2) protection—diminishing the protective capacity of Tier 2 in order to provide the levels of protection that were promised in Tier 1—shook the foundations of CALFED's three-tiered scheme for fish protection. By any interpretation, the conditions specified in the CALFED ROD as prerequisites for ESA commitments were not satisfied and ESA commitments should not have been granted in 2002.

Unequal Allocation of Risk

When the EWA was developed, it was not only a tool for resolving the conflicts between water project operations and fish protection, it was also intended to reduce the risks to both interests that resulted from competition for an over-exploited, variable but ultimately finite resource, water. As a conflict resolution tool for the Project and Management Agencies, so far, the EWA has largely succeeded. For the most part, the EWA has provided the fishery agencies with the access they need to modify water project operations in a timely manner. Risk reduction, in contrast, has not been evenly distributed and, it could be argued, the EWA, in its present form, may instead have increased the risk to fish resources in the system.

The EWA guarantees that water deliveries to state and federal water contractors will not be affected as a result of modifications in water project operations to reduce harmful impacts on endangered fishes. Risk to water contractors of reduced or interrupted water deliveries has been eliminated. By providing the Management Agencies timely access to modify project operations, the EWA has reduced the risk that, when needed, protective actions will come too late, as had often occurred in the past. However, Management Agency access, and therefore the ability to reduce risk to the fish resources, is limited, first by the finite resources of the EWA and then by the effects of unpredictable fish protection needs earlier in the year on EWA resources. For example, in years like 2001, when costs for protecting endangered winter-run chinook salmon early in the year are high, the risk to threatened delta smelt is increased because the EWA's depleted resources may be insufficient to provide comparable levels of needed protection. In effect, Management Agencies are forced to gamble with their fish protection tools and, to date, their strategy has been to withhold protection or provide minimal levels of protection, less than would be preferred, in order to husband their finite resources.

In their present form, the Tier 3 protocols exacerbate the risks to the multiple endangered fish species in the watershed that are affected by water project operations. The extensive modeling and gaming exercises that were used to develop the EWA and CALFED's three-tiered protection strategy clearly demonstrated that a supplemental level of protection to backstop Tiers 1 and 2 would be needed in some years to satisfy ESA-mandated protections for listed species. Precluding use of Tier 3 until after all EWA resources have been exhausted and then setting the standard for its use as "jeopardy", a level of impacts by the projects that immediately threatens the continued existence of a listed species, effectively guarantees that the EWA will continue to be applied in an overly conservative manner, particularly in those years when fish protection needs may be greatest. Alternatively, if Tier 3 is called upon, all other listed species impacted by water project operations during the remainder of the water year would be without any Tier 2 protection (including apparently even pre-planned fish protection programs like VAMP) and eligible for protection only in the event they too were jeopardized by project operations. At a minimum, the Tier 3 protocols conflict with and likely inhibit CALFED's objectives for the EWA to protect and *promote recovery* of listed fish species. These Tier 3 protocols also set the stage for potential conflict among Management Agency members charged with protecting and recovering different ESA-listed species, NOAA Fisheries, responsible for chinook salmon and steelhead, which are most vulnerable to water project impacts in the fall and winter, and the USFWS, which protects delta smelt and splittail from water project operations during the spring and early summer.

CONCLUSIONS AND RECOMMENDATIONS

The EWA is half way through its planned four-year trial. Has it fulfilled its promise of endangered species protection and recovery? With regard to species recovery, it is too early to tell and, unlike 2001, this year offered few opportunities to test the EWA's capability to satisfy specific ESA-mandated protections such as take limits. Can the EWA be improved for the coming years? Based on its performance during its first two years, it must be improved, first to provide the levels of function and fish protection originally promised, and then to add the new resources necessary to compensate for the additional impacts of new storage and conveyance projects, some of them already operational.

The *First Annual State of the Environmental Water Account Report* offered a number of specific recommendations that addressed flaws and limitations identified during the first year. Many of the recommendation made by the independent science panel that reviewed the EWA addressed similar issues and concerns. In its second year, the EWA showed improvement in some areas but many of its most serious problems were not remedied. In light of the changed landscape of CALFED and its foundational levels of baseline protection, progress towards resolving these problems takes on greater urgency.

1. In 2002, as the critical fish protection season approached, the EWA was once again seriously under-endowed and incomplete, lacking both its prescribed liquid assets as well as the promised groundwater reserves.

Recommendation: CALFED should work with the Project Agencies to insure that all elements of the EWA, as described in the ROD, are unequivocally and fully in place before December 2002. At a minimum, the EWA should be supplied with at least 50% of annual purchased water supplies and 100% of the one-time deposit of 200,000 AF of water.

2. The EWA needs greater access to water project facilities and operational flexibility for acquiring and managing its water.

Recommendation: Description and conditions for use of the EWA's variable assets to be included in the 2003 Interim Protocols for the Operation of the EWA should be revised to correct errors and to reliably provide the EWA with the amounts of water called for in the ROD.

Recommendation: CALFED should work with the Project Agencies to negotiate contracts for short-term storage and/or 1:1 exchanges of EWA water with south-of-Delta water contractors. Prices for short-term storage and exchanges should be cost-based, with the EWA responsible for conveyance and pumping costs only. At a minimum, options for short-term storage and/or exchanges for 25% of the EWA's annual water supply should be in place by December 2002.

Recommendation: CALFED should work with the Project Agencies to acquire secure (i.e., "non-spillable"), long-term space in existing storage facilities for the EWA and/or the EWA should be granted rights to space in new, publicly subsidized groundwater banks expected to be operational in the next few years.

3. The EWA needs a secure, multi-year funding base and the ability to carry unspent funds forward to the following year. Funding the EWA through annual appropriations is risky and impairs the ability of Project Agencies to negotiate water and groundwater storage acquisitions and options.

Recommendation: CAFLED should pursue funding the EWA through volume-based user fees, appropriately allocating the costs of mitigating environmental and fisheries impacts of water project operations to water project and contractor beneficiaries.

4. The EWA was designed to operate in concert with CVPIA (b)(2) water and to provide protections supplemental to those encompassed in CALFED's baseline Tier 1. Reductions in Tier 1 protection must be reversed to provide the equivalent level of protection specified in the ROD without added uncompensated additional protection responsibilities to the EWA.

Recommendation: CALFED should work with the Department of Interior to develop strategies to replace the protections and environmental water lost as the result of the recent (b)(2) court rulings. Interior should reverse its decision not to appeal this ruling.

Recommendation: CALFED should work with the Department of Interior and its member agencies, USFWS and USBR, to revise the current operational and accounting structure for the (b)(2) account in order to allow effective use of the remaining water available for discretionary fish protection.

5. The present Tier 3 protocols exacerbate the risk to ESA-listed species and conflict with CALFED's objectives for the EWA to protect and promote recovery of endangered fish species.

Recommendation: CALFED should work with the Management Agencies to revise the Tier 3 protocols, with particular emphasis on identifying tools and strategies that would be available to provide the required Tier 2 levels of fish protection during the period following use of Tier 3.

6. In 2002, ESA commitments were granted despite CALFED's failure to provide its own explicitly identified prerequisite levels of baseline and Tier 2 protections.

Recommendation: The Management Agencies should not grant ESA commitments while the EWA is still in an experimental and developmental phase. At a minimum, ESA commitments should be withheld until the EWA has been fully supplied with specified assets and operational tools. In addition, based in the experience of 2002, guaranteed access to short-term storage and/or 1:1 exchanges should also be included as a prerequisite for ESA commitments.

Recommendation: The Management Agencies should not grant ESA commitments until the (b)(2) environmental water dedication included in the CALFED ROD Tier 1 baseline has been restored or replaced.

Recommendation: Management Agencies should reserve the right to void ESA commitments if either Tier 1 baseline protections and/or Tier 2 Project Agency commitments are not fully satisfied during implementation of the EWA at any time during the water year.

7. Scientifically based monitoring and analytical tools necessary to evaluate the effects of EWA actions, a crucial element of any experiment, remain inadequate. Understanding and quantifying the effects of EWA actions, conceptually and specifically, is necessary to evaluate the efficacy of the EWA for endangered species protection and recovery and to provide the information necessary for continued adaptive modification of the EWA to improve its function.

Recommendation: Hypotheses regarding the efficacy of EWA to reduce impacts of water project operations on fish species should be developed and tested using analyses of existing data, results of ongoing experiments and modeling simulations, and evaluated using multiple indicators, including those for fish survival, movement and distribution, salvage rates, instream flows and Delta hydrodynamics, ecosystem function and habitat quality.

Recommendation: Specific hypotheses regarding the effects of EWA actions on reducing impacts of water project operations on fish species should be tested each time an EWA action is implemented using data collected from the ecosystem and fish species that are the targets of the EWA action.

In conclusion, it should be noted that despite the shortcomings and uncertainties associated with the EWA's ability to secure adequate assets and provide a level of fishery protection commensurate with ESA commitments, CALFED agencies are currently contemplating allowing even higher levels of pumping in the south Delta by permitting use of additional export capacity at the SWP pumping facility. CALFED's analysis to date shows that expanding exports would result in higher levels of endangered species take than in many years in the historical record, but the agencies assume that the EWA's assets can be enlarged and its operations improved sufficiently to allow a new ESA commitment that fishery impacts can be offset without reducing export yield from the increased pumping regime. All the evidence assembled and discussed in this report suggests that this is a dangerous and unjustified assumption.

Appendix I

Origins of the Environmental Water Account and a Review of its First Year

A Brief Summary of the *First Annual State of the Environmental Water Account Report*

ORIGIN OF THE ENVIRONMENTAL WATER ACCOUNT

The Environmental Water Account was born out of the conflict between water management operations to support delivery of water for consumptive use and the protection of fishes endangered by those operations. By the 1990s, after a half-century of water development and ever increasing levels of water diversion, five fish species that rely on the Sacramento-San Joaquin watershed and its estuary, the Delta, were listed under the federal ESA in the space of less than a decade.[11] As required by law, the US Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) Fisheries (formerly National Marine Fisheries Service) established "take limits", intended to limit the numbers of endangered fish killed at the federal Central Valley Project (CVP) and State Water Project (SWP) pumps. However, on the numerous occasions when these take limits were exceeded, the ESA-mandated consultation between the fishery agencies and the water project managers over how to modify water export operations often took many weeks. Meanwhile, the endangered fish continued to be destroyed at the pumps, and take limits in effect were not enforced. Alternatively, in those cases when an export reduction was made to protect the fish, it potentially disrupted water deliveries to south-of-Delta contractors and sometimes materially reduced the amount of water the projects were able to deliver.

The Setting

California's Sacramento-San Joaquin watershed is one of the most highly modified and controlled hydrological systems in the world, with most of the development aimed at maximizing water storage, conveyance, and diversion for export to drier areas of the state. All but one of the major rivers are dammed, blocking passage of many fish species, substantially altering seasonal flow patterns and magnitudes, and degrading downstream habitats. In the upper reaches of the watershed's estuary, the Delta, two huge pumping facilities, one operated by the federal Central Valley Project and the other by the State Water Project, can extract almost 30,000 acre feet, or nearly 10 billion gallons, of water per day.

The EWA, when originally conceived, was intended to provide a buffer for endangered species by acquiring water that would be

[11] Federal ESA status and listing dates: Winter-run chinook salmon, endangered, 1994; Delta smelt, threatened, 1993; Steelhead (Central Valley ESU), threatened, 1998. Spring-run chinook salmon, threatened, 1999; Splittail, threatened, 1999.

immediately available for fish protection while longer-term arrangements were being made between the fishery agencies and the water project operators. In its final form, the EWA became a mechanism for facilitating fishery agency access to modifying water management operations for fish protection while compensating the water projects for any costs associated with providing those necessary protections. Further, the ability of the fishery agencies to modify water project operations was limited: first, by the size of the EWA and its current balance—fish protection actions were allowed only if there was enough EWA water to cover the projected cost; and second, by the commitment from the fisheries agencies that they would require no additional water for protection of ESA species, referred to as "ESA commitments".

The EWA and CALFED's Three Tiers of Protection

As described in the CALFED Record of Decision (ROD, pp 54), the purpose of the EWA was to "provide water for protection and recovery of fish *beyond that available through existing regulatory actions* (emphasis added)." Thus, protection and habitat benefits afforded by the EWA and use of its water were supplemental to other fish and environmental protections already in place and identified by CALFED as the "baseline level of protection". Baseline protections, or Tier 1, included: the Water Quality Control Plan (WQCP), a set of water quality and operational standards for the Delta issued by the State Water Resources Control Board in 1995; full use of Central Valley Project Improvement Act (CVPIA) (b)(2) water as outlined in the Department of Interior's 1999 Decision; and selected protections contained in the ESA-required Biological Opinions[12] for winter-run chinook salmon and delta smelt.[13] Tier 2 protections consisted of the EWA and the assumed environmental benefits afforded by a fully funded and active Ecosystem Restoration Program. The final layer of protection, Tier 3, was the commitment of CALFED to make additional water available in the event that the combined protections of Tiers 1 and 2 were inadequate to satisfactorily protect ESA-listed species.

Endangered Species Act Commitments

In exchange for CALFED's three-tiered suite of protections, the fishery agencies agreed that they would require no reductions, beyond existing regulatory levels, in CVP or SWP Delta exports for the protection of state and federally listed threatened and endangered fish species. These ESA commitments were to be granted annually and premised on full funding and availability of the three tiers of protections, as defined in the CALFED ROD. ESA commitments were controversial for a number of reasons. First, the EWA was an untested fish protection tool—anticipated levels of protection were based on calculations derived from a series of computer simulation gaming exercises

[12] A Biological Opinion is developed after formal consultation between federal fisheries agencies and the CVP and SWP when a fish species impacted by their operations is listed under the ESA. For each listed species, the document details the allowable limits of project operation, for example minimum flow requirements in a dammed river or the maximum number of fish that can be killed within a specified period at the pumps, referred to as the take limit.

[13] Although environmental protections specified in the Biological Opinion for delta smelt, i.e., elevated San Joaquin River flows and reduced exports during the spring, are identified as a baseline, or Tier 1, protection, SWP water costs resulting for satisfying this requirement are charged to the EWA and CVP costs are charged to the (b)(2) account.

rather than empirical evidence or experience using the EWA. Second, analyses of the EWA gaming exercises during its development indicated that, in some years, it would not satisfy ESA-mandated protections such as take limits for several endangered fish species.[14] Finally, a number of parties, including The Bay Institute, were concerned that the evidence indicating that the level of protection assumed by CALFED could not always be achieved meant that the ESA commitments did not meet the minimum requirements of the ESA and were not legally defensible.

THE ENVIRONMENTAL WATER ACCOUNT IN 2001

Implementation of the EWA in Water Year 2001 required that the US Bureau of Reclamation (USBR) and the California Department of Water Resources (DWR), collectively referred to as the Project Agencies, provide the Management Agencies with a fully funded and operable EWA, integrated with other fish protection measures as defined in the CALFED ROD. Specific requirements for the EWA included a secure funding source, the suite of fixed (i.e., water) and variable assets defined in the EWA Operating Principles Agreement and, in this first year, a one-time deposit of 200,000 AF of water (or equivalent) stored south of the Delta, intended to launch the EWA and provide it with the collateral necessary to guarantee its actions. Executing such a complex program just months after the signing of the CALFED ROD was an enormous undertaking, requiring cooperation among multiple entities and a great deal of hard work. To the credit of the Management and Project Agencies, the EWA was implemented on schedule in October 2000. However, it was incomplete and under-endowed, factors that contributed to some of the serious problems it encountered in its inaugural year.

Funding

There was no federal allocation for CALFED, but the federal Central Valley Project directly contributed 72,000 AF of water stored in San Luis Reservoir to the EWA, valued at $10,000,000.[15] Funding to support EWA water purchases, operational costs, water accounting, and environmental documentation, totaling approximately $57,500,000, was provided exclusively by the State and EWA actions were consequently limited to modifying SWP operations. Fish protection actions made on federal water project operations were made using (b)(2) water.

Water Acquisition

The EWA acquired a total of 298,000 AF of water throughout the year.[16] In addition to the 72,000 AF of water provided by the CVP, the EWA purchased water from south-of-Delta contractors (127,000 AF) and north-of-Delta water users (105,000 AF, only 51,000 AF of which was available for use in Water Year 2001), and used its variable assets to acquire 2,000 AF from a relaxation of the Export/Inflow standard and capture of

[14] Analyses of results of the EWA gaming exercises were conducted by The Bay Institute and reported to CALFED in two technical memoranda dated April 4, 2000 and July 7, 2000.

[15] San Luis Reservoir is the main surface storage reservoir located south of the Delta. It is operated jointly by the CVP and SWP, which share the storage space equally.

[16] Near the end of the water year, the EWA acquired an additional 45,000 AF of water from north-of-Delta water users, but this water was intended for use in Water Year 2002.

46,000 AF of (b)(2) water released upstream (referred to a "SWP gain"). None of the one-time only deposit of 200,000 AF was acquired. Water purchases exceeded the "average annual" amounts identified by CALFED in the ROD for purchased water but water acquired through use of variable assets fell far short of anticipated quantities.

Tier 3

Tier 3 protection was not in place and, despite a CALFED promise to prepare an implementation strategy by August 2001, neither funding nor operating protocols for this third tier of protection were available during the EWA's first year.

ESA Commitments

The Management Agencies granted ESA commitments to the Project Agencies in early 2001, despite the absence of Tier 3 protections and an incomplete EWA asset portfolio. In January 2001, as the peak fish protection season approached, the EWA had only 153,000 AF, barely a quarter of the total amount proposed by CALFED.

Fish Protection

The EWA implemented ten fish protection actions for winter- and spring-run chinook salmon, steelhead and delta smelt, all between January and July 2001 and all but one of them export curtailments at the SWP.[17] Total EWA expenditures for the year were 290,000 AF, approximately 66% of the amount expected to be used per year (based on the computer modeling exercises that were used to develop the EWA), suggesting that the EWA was operated somewhat conservatively in its first year. Implementation of EWA fish protection actions was directed by teams of CALFED and agency scientists and water project operators, with input from water user and environmental stakeholder representatives, and coordinated with the (b)(2) Interagency Team.[18] Decisions to implement an action were based on evaluation of real-time biological, environmental, and operational monitoring data and projections, integrated with decision guidelines developed for the various fish species, and then balanced against availability of EWA assets (or (b)(2) water) to support the action and other anticipated fish protection needs in the future.

Highlights and Low Points

Successful Collaboration Among Diverse Agencies: Cooperation and collaboration among the fisheries scientists from the Management Agencies and project operators from the Project Agencies to implement and operate the EWA was the single most successful aspect of the EWA's first year. While specific EWA operations were not necessarily optimal uses of resources or fully successful in their objectives, the multi-agency cooperation demonstrated in the first year, as well as the active participation of

[17] Descriptions of EWA Fish Actions are posted on the CALFED Operations Group website at http://wwwoco.water.ca.gov/calfedops/2001ops.html

[18] EWA implementation is coordinated through the EWA Team (comprised of a CALFED coordinator and Management and Project Agency representatives), the Data Assessment Team (DAT, CALFED and agency scientists, project operators, and water user and environmental stakeholder representatives), the Water Operations Management Team (WOMT, Management and Project Agency managers), the CALFED Operations Group, the Operations and Fisheries Forum (OFF, stakeholder representatives), and the (b)(2) Interagency Team.

environmental and water user stakeholders in developing and managing the EWA, boded well for the future of this new tool.

Winter-run Chinook Salmon Take Limit Exceeded: On March 5, 2001, despite use of nearly 200,000 AF of EWA water, the ESA-mandated take limit for winter-run chinook salmon was exceeded nearly threefold.[19] While a number of factors probably contributed to this failure, the cessation of EWA protective actions in the middle of this historic take exceedance and the inability of the EWA and Project Agencies to respond flexibly by using alternative operational strategies were both significant departures from the fish protection strategies specifically developed for the EWA, and demonstrated serious inadequacies with EWA structure and management.

Operational Inflexibility Contributes to Winter-run Chinook Salmon Take: Throughout the winter-run chinook salmon take exceedence, 90% of the fish were taken at the SWP. Yet, when the opportunity arose to use a Joint Point of Diversion (JPOD)[20] action to shift pumping from the disproportionately harmful SWP to the CVP, this flexible operation was denied because the necessary permits were not in place. At that time, this was the only viable strategy for reducing take of the endangered fish and exactly the type of flexible and coordinated project operation with minimal impacts on deliveries envisioned by EWA designers.

SWP Water Management Operations Cost the EWA Water: In March 2001, one week after the EWA "ran out of water" and terminated protective action for winter-run chinook salmon, the SWP came within a few thousand acre feet of filling its share of San Luis Reservoir. This was significant to the EWA because, upon filling, all EWA debts to the SWP would be forgiven. However, anticipating the availability of excess pumping capacity and exportable water in the Delta, the SWP declared that "Article 21"[21] water was available to its south-of-Delta contractors and began delivering exported water directly to contractors rather than San Luis Reservoir. Availability of new south-of-Delta storage enabled contractors to take Article 21 water at unexpectedly high rates. Thus export rates remained high (in part because the EWA did not have the assets to cover a fish protection export curtailment) but the reservoir never filled, EWA debt was not

[19] The take limit for winter-run chinook salmon was 7,404 fish, 2% of the estimated juvenile population emigrating through the Delta. However, based on the unexpectedly high numbers of fish that appeared at the pumps as well as apparent conflicts in some of the data used to calculate juvenile population size, called the juvenile production estimate (JPE), a number of fisheries scientists, agency personnel and other stakeholder participants have questioned the accuracy of the JPE, suggesting that it underestimated the true number of juvenile fish, and that the resultant ESA take limit was therefore erroneously low.

[20] Joint Point of Diversion (JPOD) is a cooperative agreement between the federal and state water projects that, under certain conditions, allows one project to pump water for the other. Typically, it is the SWP that uses its greater pumping capacity to export water for the CVP. However, in June 2001, the CVP pumped water for the SWP when the state project's aqueduct was under repair. Use of JPOD is one of the EWA's variable assets, with 50% of all JPOD water pumped by the SWP dedicated to the EWA.

[21] When the SWP fills its own south-of-Delta storage to capacity and there is a temporary surplus of water available for export in the Delta (i.e., export operations are not limited by either environmental or water quality standards like the E/I ratio), it can pump the extra water to contractors who have a place to store the water, for example in a groundwater bank. This water is referred to as Article 21 water and, compared to SWP contract water, it is much less expensive.

forgiven and was instead covered with purchased water, much of it transferred through the Delta later in the year at additional costs.

Delta Smelt Take Limits Not Exceeded: For the first time in several years, ESA-mandated take limits for juvenile delta smelt were not exceeded. This successful fish protection effort was at least partly attributable to more effective implementation of the EWA, including a proactive, analytical management approach supported by a superior monitoring program and improved technical collaboration between the Management and Project Agencies.

EVALAUTION AND RECOMMENDATIONS FROM 2001

In *The First Annual State of the Environmental Water Account Report*, The Bay Institute identified a several critical problems with the EWA that required resolution if the State and federal agencies intended to continue implementing this new tool and basing ESA commitments on its performance. The report offered a number of recommendations for improving both the structure and operation of the EWA, including:

- For water year 2002, all elements of the EWA, including the initial 200,000 AF deposit, and Tier 3 should be in place before December 2001. ESA commitments should not be granted until the EWA and Tier 3 were fully funded, supplied, and functional.

- Volume-based user fees were a more reliable source of funding for the EWA than annual state and/or federal allocations, and should be pursued.

- Effective use of the EWA's limited resources required improved monitoring, analysis and decision guidelines, and greater integration with other environmental and non-environmental water management initiatives.

- The EWA, which was designed to provide protection at 1996-2000 levels of operations and demands, should not be used to offset foreseeable environmental impacts of changes in water export, conveyance, or storage capacity. In the event of such changes, EWA size and operational tools must be adjusted to provide for an equivalent level of fish protection.

- Cooperation and coordination between fisheries and water managers was essential for effective implementation of the EWA and, during 2001, was generally good. However, the Project Agencies should clarify existing ambiguities in water accounting, export of Article 21 water, and San Luis Reservoir operations relative to EWA debt and flexible operations of the two pumping plants.

- The EWA is an experiment, therefore specific hypotheses regarding its efficacy needed to be developed and its effectiveness monitored and measured using multiple analyses and indicators.

In addition to The Bay Institute's evaluation, a panel of multidisciplinary, independent scientists, convened by CALFED, reviewed the performance of the EWA during its first year. Although the panel focused on the state of the science that applied to EWA concepts, actions and justifications, their analysis and resultant recommendations were wide ranging, covering both institutional as well as operational aspects of the EWA. The panel recognized that the EWA had multiple objectives: protect of fish from adverse impacts of water management operations; improve water supply reliability for the CVP and SWP; and reduce conflicts in managing the Delta simultaneously for ecosystem health and water supply. Their recommendations focused on remedying the limitations they observed in EWA function during the first year and the scientific rationale underlying EWA actions for fish protection. They included:

- Effective operation of the EWA was labor intensive. CALFED should release sufficient agency staff time to support the monitoring, modeling, and analysis necessary to effectively guide EWA operations and evaluation.

- CALFED should recruit and support non-agency scientists to assist in EWA analysis and conduct EWA-related research.

- With agency and non-agency scientists, CALFED should conduct research, including analysis of existing data, to fill fundamental gaps in knowledge of the biology of fish species that are targets of EWA protection.

- CALFED should evaluate existing constraints on EWA flexibility, including the complicated statutory, regulatory, and contractual rules that govern water project operations, and provide the EWA with the resources and information necessary to use flexibility effectively. One suggested remedy was to allow the EWA to carry over unspent money and water assets from one year to the next without fear of loss.

- CALFED should use scientifically based risk analysis to estimate the water supply reliability afforded by the EWA and to determine the needed size and frequency of use for Tier 3 protections.

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